PHYTOTOXICOLOGY SECTION INVESTIGATION IN THE VICINITY OF ETHYL CORPORATION AUGUST 31, 1990

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Prepared By:

Phytotoxicology Section
Air Resources Branch
Ontario Ministry of the Environment

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1 Background

At 3:16 pm on August 28, 1990 there was a release of approximately 350 kg of tetraethyl lead to the atmosphere at Ethyl Corporation, Corunna, that auto-ignited creating a large black cloud. The winds at this time were 22 km/hr from the WNW. The black cloud was observed, still intact, 4 km to the ESE crossing the Petrosar complex at the corner of highway 40 and Hill St. shortly after the explosion. Modelling of the plume indicated that significant levels of lead oxide would have existed in the centre of the cloud at distances of one to two kilometers from Ethyl Corporation.

The Phytotoxicology Section, Air Resources Branch, Ministry of the Environment was requested by the Sarnia District MOE office to conduct a survey of vegetation in the downwind direction to determine if there was any significant lead fall out. The Phytotoxicology Section has conducted two surveys in the past after similar incidents (1)(2). In neither case was significant amounts of lead found in the tree foliage along the projected plume's path.

2 Methods

On August 31, 1990, Randall Jones of the Phytotoxicology Section, Air Resources Branch collected duplicate foliage samples at five locations within 4 km of Ethyl Corporation. The sampling stations were located along the projected path of the cloud. Silver maple trees were sampled at Stations 7,8,9 and 10 and cottonwood, the only tree species available near the company, was sampled at Station 11. The samples where collected using standard Phytotoxicology sampling techniques (4).

All samples were delivered to the Phytotoxicology Section sample processing laboratory in Toronto where they were dried and ground before being submitted to the Inorganic Trace Contaminants Section, Laboratory Services Branch for inorganic chemical analysis. The samples were analyzed for lead.

3 Results

The results of the chemical analysis for lead in tree foliage are given in the following table. Also listed in the table is the Phytotoxicology Section Urban Upper Limit of Normal for lead in tree foliage (5). The results are expressed as µg/g dry weight and are the mean of the duplicate samples collected at each site.

Table 1: Results of Lead Analysis of Tree Foliage Collected in the Vicinity of Ethyl Corporation, Corunna, on August 31, 1990

Station Number	Tree Species	Distance & Direction from Ethyl	Lead (µg/g dry wt.)
7	Silver Maple	3.3 km ESE	2.4
8	Silver Maple	3.9 km ESE	1.9
9	Silver Maple	1.2 km ESE	3.3
10	Silver Maple	1.2 km E	8.7
11	Cotton wood	0.4 km E	7.9
	Rural Upper Limit of Normal		30

4 Discussion

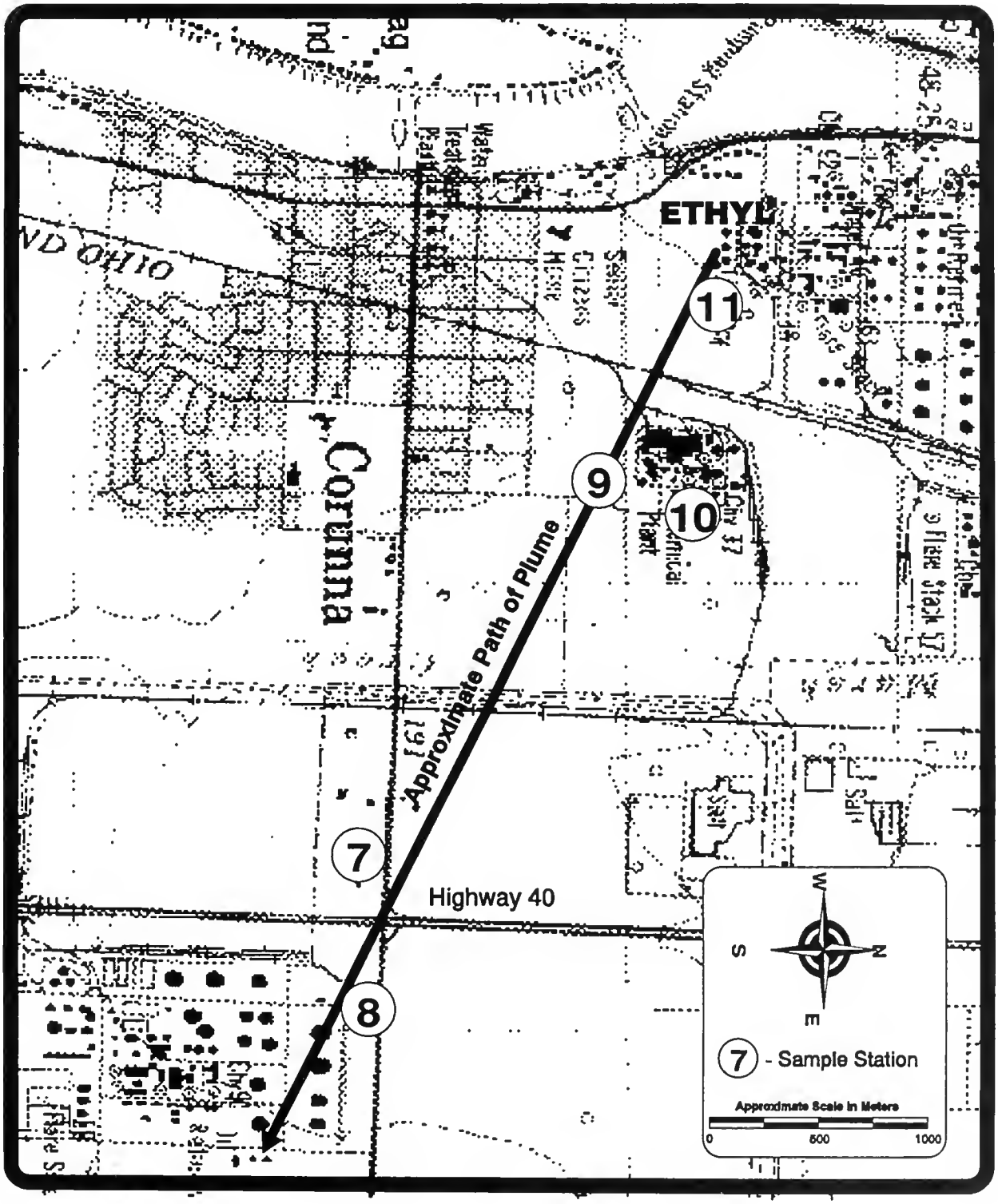
All of the results were well below the Rural ULN for lead in tree foliage. There is a small trend of decreasing levels with increased distance from the company. However the sampling sites move from an urban land use category for station 9, 10 and 11 to a rural land use category for stations 7 and 8. This could account for the decreasing trend with distance from Ethyl. All of the results are similar to results for lead in silver maple collected around Ethyl in 1986, 1987 and 1989 (1,2,3).

5 Summary

There was no evidence that the explosion of tetraethyl lead at Ethyl Corporation, Corunna on August 28, 1990 resulted in significant deposits of lead to tree foliage within three kilometers of the company. The small decrease in lead concentration with increased distance from the company may be accounted for by the transition from urban to rural land use.

Appendix A: Map of Sampling Station

Sketch Map Showing the Approximate locations of the Five Stations in the Vicinity of Ethyl Corp., Corunna, Sampled for Tree Foliage On August 31, 1990.



Appendix B: References

(1) Ontario Ministry of the Environment, Air Resources Branch. 1987. A Report on a Phytotoxicology Section Investigation in the Vicinity of Ethyl Corporation, Corunna on August 5, 1986. ARB-201-86-PHYTO.

(2) Ontario Ministry of the Environment, Air Resources Branch. 1988. Phytotoxicology Section Investigation in the Vicinity of Ethyl Corporation, Corunna on June 24, 1987. ARB-205-87-PHYTO. ISBN-0-7729-4015-0.

(3) Ontario Ministry of the Environment, Air Resources Branch. 1991. Phytotoxicology Section Investigation in the Vicinity of Ethyl Corporation, Corunna, 1989. ARB-082-89-PHYTO.

(4) Ontario Ministry of the Environment, Air Resources Branch. 1983. Field Investigation Manual. Phytotoxicology Section - Air Resources Branch; Technical Support Sections - NE and NW Regions

(5) Ontario Ministry of the Environment, Air Resources Branch. 1989. Ontario Ministry of the Environment "Upper Limit of Normal" Contaminant Guidelines for Phytotoxicology Samples. Phytotoxicology Section - Air Resources Branch ARB-138-88-Phyto. ISBN: 0-7729-5143-8

Appendix C

Derivation and Significance of the MOE Phytotoxicology "Upper Limits of Normal" Contaminant Guidelines.

The MOE Upper Limits of Normal (ULN) contaminant guidelines represent the expected maximum concentration in surface soil, foliage (trees and shrubs), grass, moss bags, and snow from areas in Ontario not exposed to the influence of a point source of pollution. Urban ULN guidelines are based on samples collected from developed urban centres, whereas rural ULN guidelines were developed from non-urbanized areas. Samples were collected by Phytotoxicology staff using standard sampling procedures (ref: Ontario Ministry of the Environment 1983, *Phytotoxicology Field Investigation Manual*). Chemical analyses were conducted by the MOE Laboratory Services Branch.

The ULN is the arithmetic mean, plus three standard deviations of the mean, of the suitable background data. This represents 99% of the sample population. This means that for every 100 samples which have not been exposed to a point source of pollution, 99 will fall within the ULN.

The ULNs do not represent maximum desirable or allowable limits. Rather, they are an indication that concentrations that exceed the ULN may be the result of contamination from a pollution source. Concentrations that exceed the ULNs are not necessarily toxic to plants, animals, or people. Concentrations that are below the ULNs are not known to be toxic.

ULNs are not available for all elements. This is because some elements have a very large range in the natural environment and the ULN, calculated as the mean plus three standard deviations, would be unrealistically high. Also, for some elements, insufficient background data is available to confidently calculate ULNs. The MOE Phytotoxicology ULNs are constantly being reviewed as the background environmental data base is expanded. This will result in more ULNs being established and may amend existing ULNs.